Vincotech

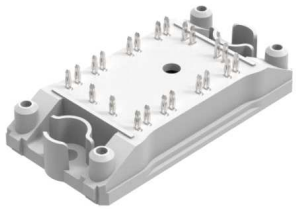
10-PC094PB035ME02-L629F36Y
datasheet

***fast* PACK 0 SiC** **900 V / 35 mΩ**

Features

- 900V SiC MOS
- Switching frequency up to 400kHz
- Suitable for hard switching/soft switching
- Increased power density
- NTC

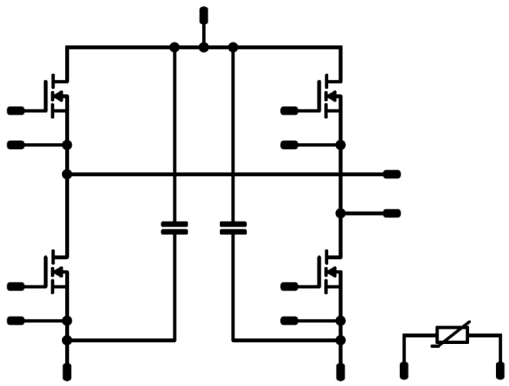
flow 0 12 mm housing



Target applications

- Power Supply
- Special Application
- Welding & Cutting

Schematic



Types

- 10-PC094PB035ME02-L629F36Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
H-Bridge Switch				
Drain-source voltage	V_{DSS}		900	V
Drain current	I_D	T_j = T_{jmax} T_S = 80 °C	42	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	180	A
Avalanche energy, single pulse	E_{AS}	I_D = 22 A V_{DD} = 50 V	110	mJ
Total power dissipation	P_{tot}	T_j = T_{jmax} T_S = 80 °C	85	W
Gate-source voltage	V_{GSS}		-8/+19	V
Maximum Junction Temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Capacitor (DC)				
Maximum DC voltage	V_{MAX}		1000	V
Operation Temperature	T_{op}		-55…+125	°C
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{jop}		-40…(T_{jmax} - 25)	°C
Isolation Properties				
Isolation voltage	V_{isol}	DC Test Voltage* t_p = 2 s	6000	V
		AC Voltage t_p = 1 min	2500	V
Creepage distance			min. 12,7	mm
Clearance			9,6	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
H-Bridge Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		15		40	25 125 150		35 43 47	39	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$			0,01	25	1,7	2,4	3,5	V
Gate to Source Leakage Current	I_{GSS}		15	0		25			500	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	900		25			200	µA
Internal gate resistance	r_g							2,35		Ω
Gate charge	Q_g							61		
Gate to source charge	Q_{GS}		-4/15	400	40	25		15		nC
Gate to drain charge	Q_{GD}							24		
Short-circuit input capacitance	C_{iss}							1320		
Short-circuit output capacitance	C_{oss}	f= 1 MHz	0	600		25		120		pF
Reverse transfer capacitance	C_{rss}							8		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,12		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$					25 125 150		13 13 14		
Rise time	t_r	R_{goff} = 4 Ω R_{gon} = 4 Ω				25 125 150		5 5 5		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		43 43 43		
Fall time	t_f		+15/-5	600	40	25 125 150		11 12 11		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,5 µC Q_{rFWD} = 0,9 µC Q_{rFWD} = 0,8 µC				25 125 150		0,459 0,447 0,471		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,082 0,055 0,048		

Characteristic Values

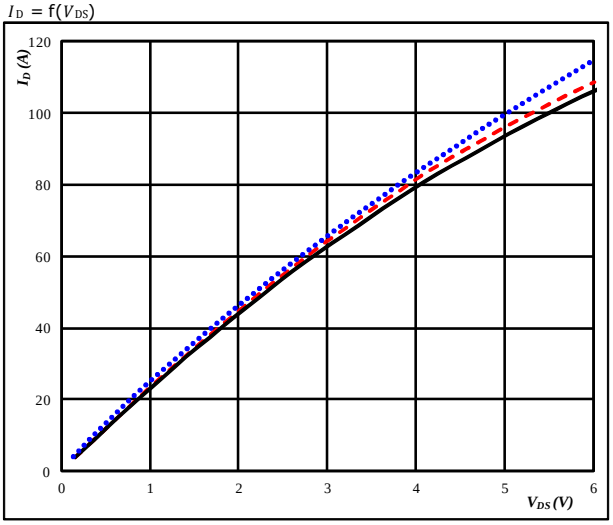
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 7344 A/µs di/dt = 7855 A/µs di/dt = 8439 A/µs	+15/-5	600	40	25 125 150		54 58 63		A
Reverse recovery time	t_{rr}					25 125 150		15 15 15		ns
Recovered charge	Q_r					25 125 150		0,455 0,875 0,825		µC
Reverse recovered energy	E_{rec}					25 125 150		0,028 0,196 0,106		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		11049 13683 15876		A/µs
Capacitor (DC)										
Capacitance	C							2x47		nF
Tolerance							-20		+20	%
Dissipation factor		f= 1 kHz				25			2,5	%
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %				25		4000		K
Vincotech NTC Reference									I	

H-Bridge Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

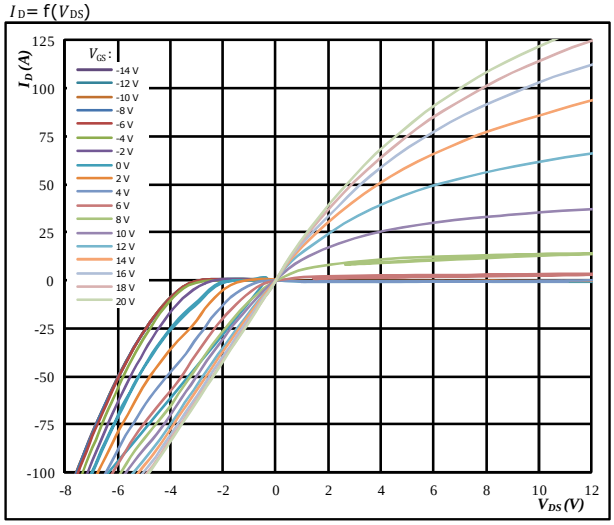


t_p =	250	µs		25 °C	
V_{GS}=	15	V	T_j:	125 °C	
				150 °C	

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

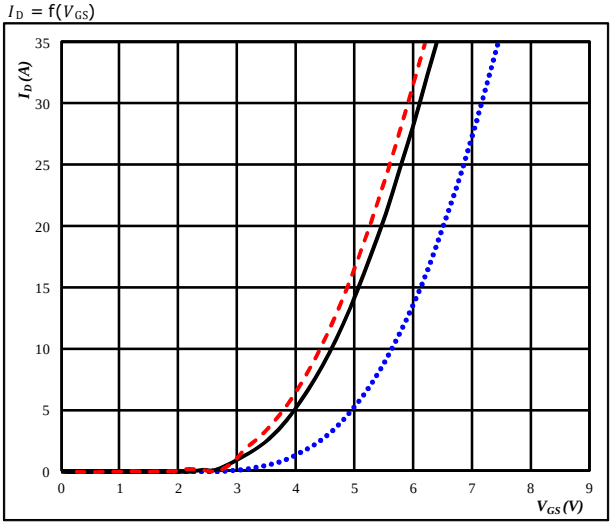


t_p =	250	µs
T_j =	150	°C
V_{GS} from	7 V to 15 V in steps of 1 V	

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

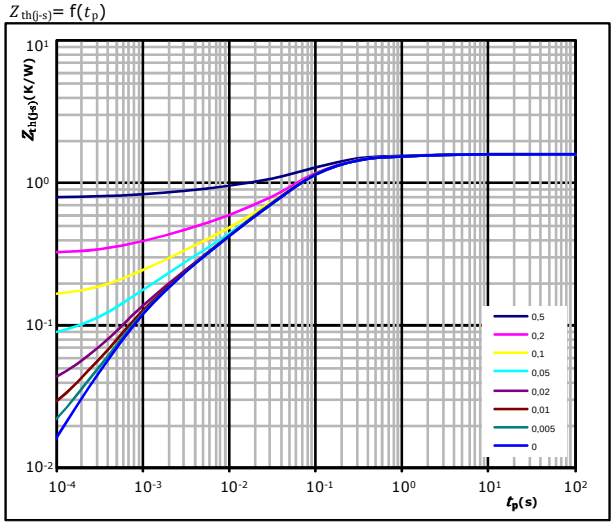


t_p =	100	µs		25 °C	
V_{DS} =	10	V	T_j:	125 °C	
				150 °C	

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$



D =	t_p / T	
$R_{th(j-s)}$ =	1,12	K/W

MOSFET thermal model values

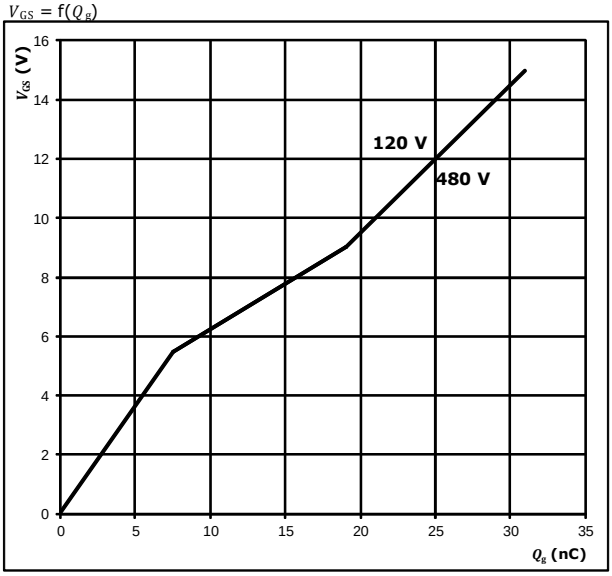
R (K/W)	τ (s)
6,72E-02	2,72E+00
1,48E-01	4,14E-01
8,68E-01	8,33E-02
2,53E-01	2,89E-02
1,69E-01	5,15E-03
1,06E-01	9,10E-04

H-Bridge Switch Characteristics

figure 5. **MOSFET**

Gate voltage vs Gate charge

$V_{GS} = f(Q_g)$



At

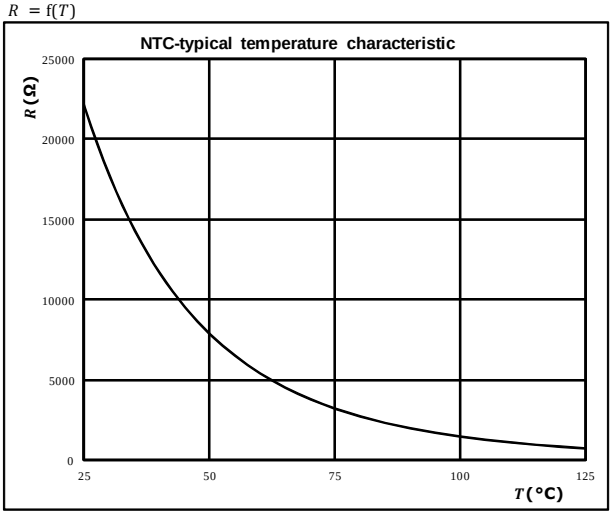
I_D=	40	A	V_{DS}=	400	V
T_j =	25	°C	I_{GS}=	200	mA

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic
as a function of temperature

$R = f(T)$

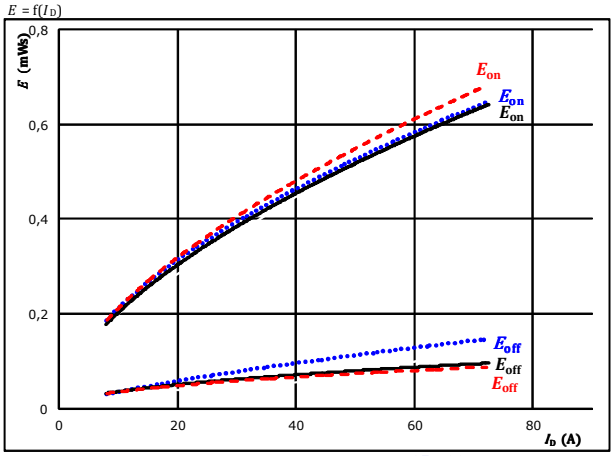


Switching Characteristics

figure 1. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



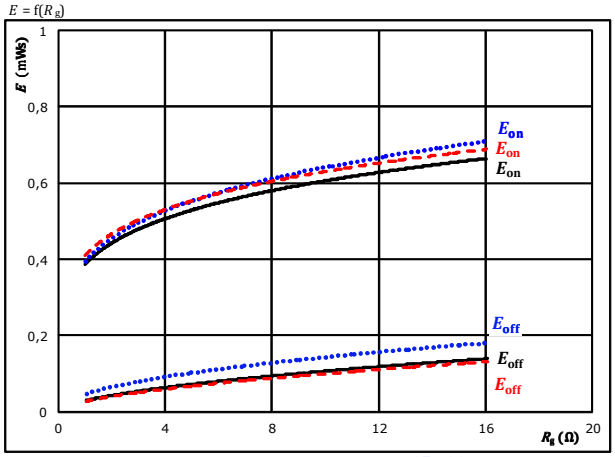
With an inductive load at

V_{DS} =	600	V	T_J:	25 °C	·····
V_{GS} =	+15/-5	V		125 °C	———
R_{gon} =	4	Ω		150 °C	- - -
R_{goff} =	4	Ω			

figure 2. **MOSFET**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



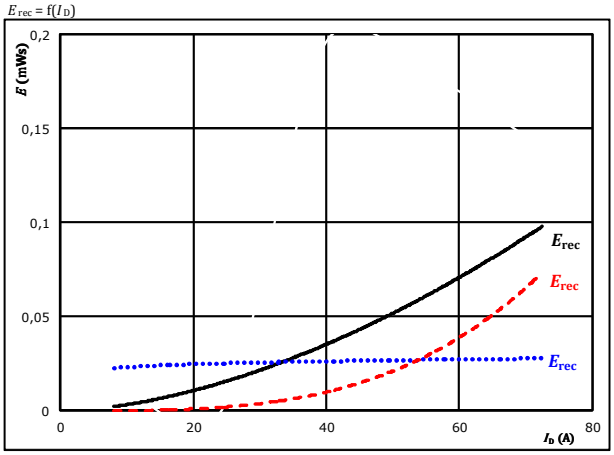
With an inductive load at

V_{DS} =	600	V	T_J:	25 °C	·····
V_{GS} =	+15/-5	V		125 °C	———
I_D =	40	A		150 °C	- - -

figure 3. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



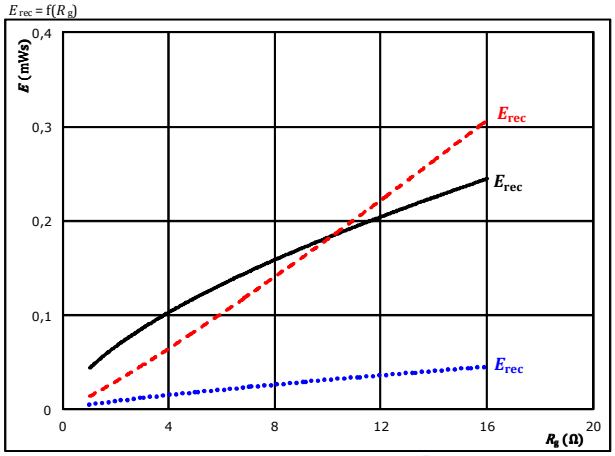
With an inductive load at

V_{DS} =	600	V	T_J:	25 °C	·····
V_{GS} =	+15/-5	V		125 °C	———
R_{gon} =	4	Ω		150 °C	- - -

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

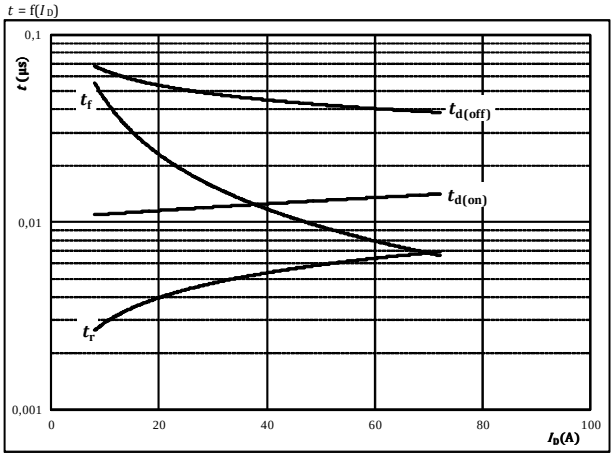
V_{DS} =	600	V	T_J:	25 °C	·····
V_{GS} =	+15/-5	V		125 °C	———
I_D =	40	A		150 °C	- - -

Switching Characteristics

figure 5. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



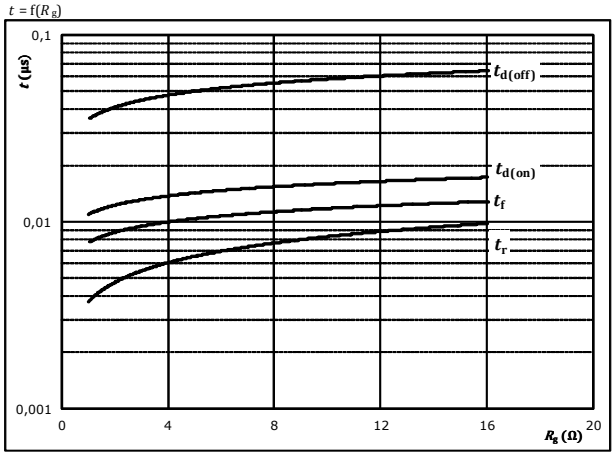
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	+15/-5	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(R_g)$



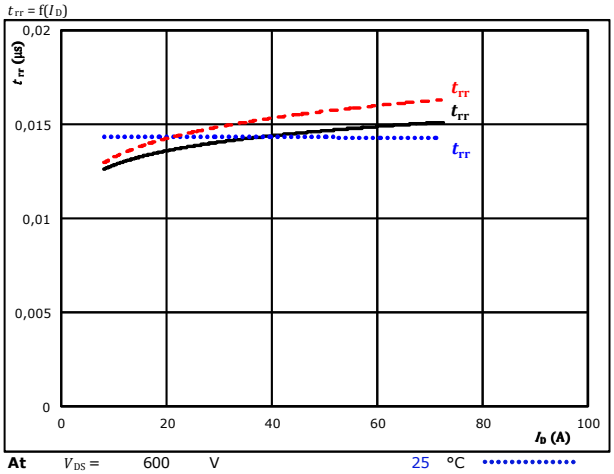
With an inductive load at

T_j =	150	°C
V_{DS} =	600	V
V_{GS} =	+15/-5	V
I_D =	40	A

figure 7. **FWD**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$

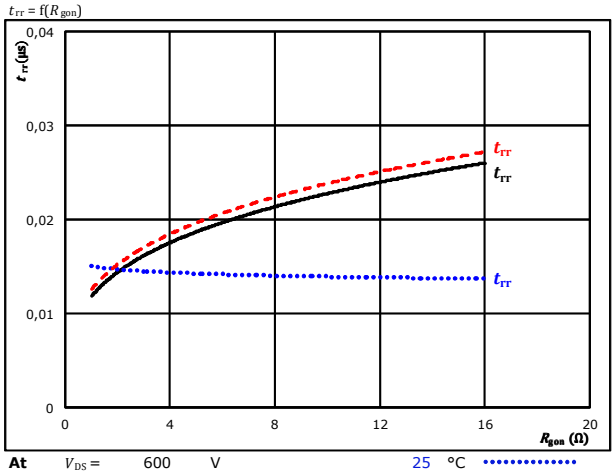


At	V_{DS} =	600	V		25 °C
	V_{GS} =	+15/-5	V	T_j:	125 °C
	R_{gon} =	4	Ω		150 °C

figure 8. **FWD**

Typical reverse recovery time as a function of MOSFET turn on gate resistor

$t_{rr} = f(R_{gon})$



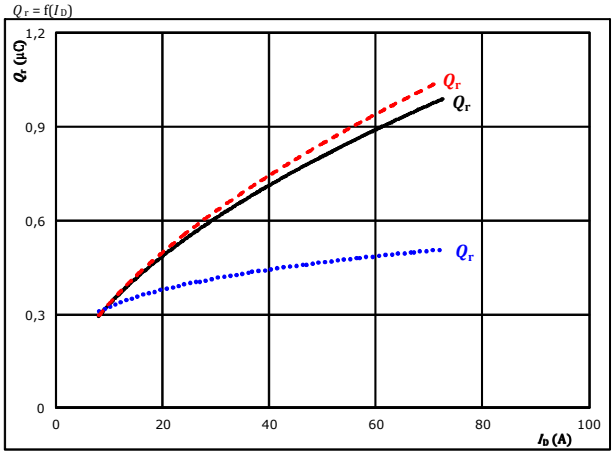
At	V_{DS} =	600	V		25 °C
	V_{GS} =	+15/-5	V	T_j:	125 °C
	I_D =	40	A		150 °C

Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

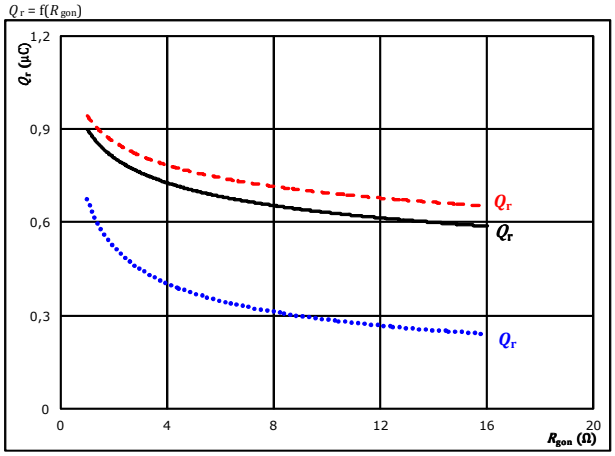


At	V_{DS} =	600	V		25 °C	
	V_{GS} =	+15/-5	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 10. **FWD**

Typical recoved charge as a function of MOSFET turn on gate resistor

$Q_r = f(R_{gon})$

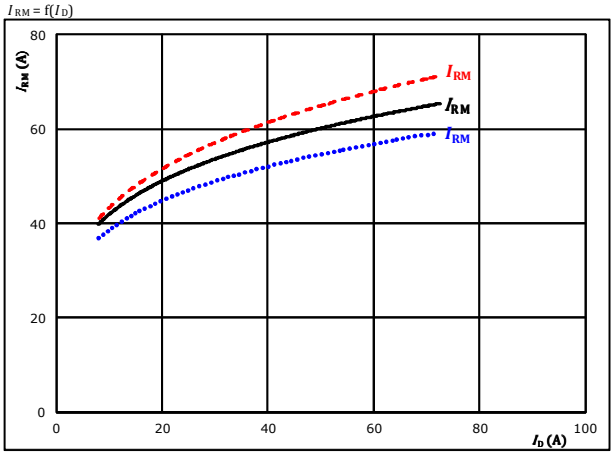


At	V_{DS} =	600	V		25 °C	
	V_{GS} =	+15/-5	V	T_j:	125 °C	
	I_D =	40	A		150 °C	

figure 11. **FWD**

Typical peak reverse recovery current current as a function of drain current

$I_{RM} = f(I_D)$

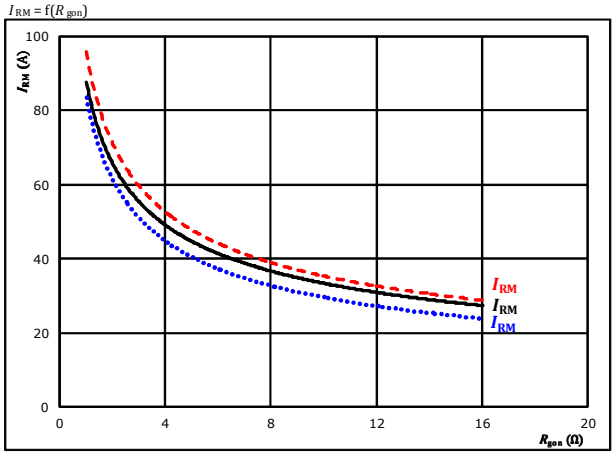


At	V_{DS} =	600	V		25 °C	
	V_{GS} =	+15/-5	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 12. **FWD**

Typical peak reverse recovery current as a function of MOSFET turn on gate resistor

$I_{RM} = f(R_{gon})$



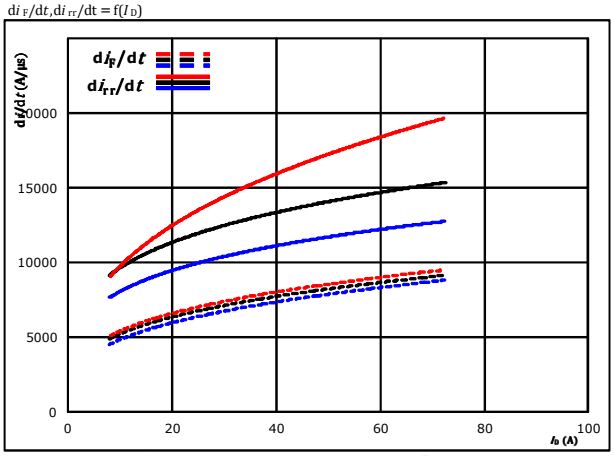
At	V_{DS} =	600	V		25 °C	
	V_{GS} =	+15/-5	V	T_j:	125 °C	
	I_D =	40	A		150 °C	

Switching Characteristics

figure 13. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of drain current

$di_F/dt, di_{rr}/dt = f(I_D)$

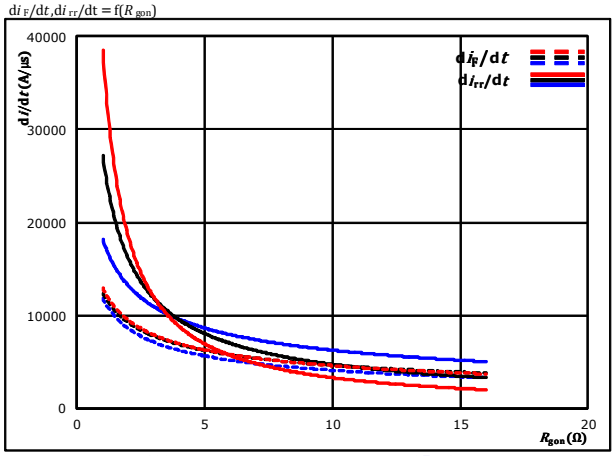


At	V_{DS} =	600	V		
	V_{GS} =	+15/-5	V	T_j:	25 °C
	R_{gon} =	4	Ω		125 °C
					150 °C

figure 14. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of MOSFET turn on gate resistor

$di_F/dt, di_{rr}/dt = f(R_{gon})$



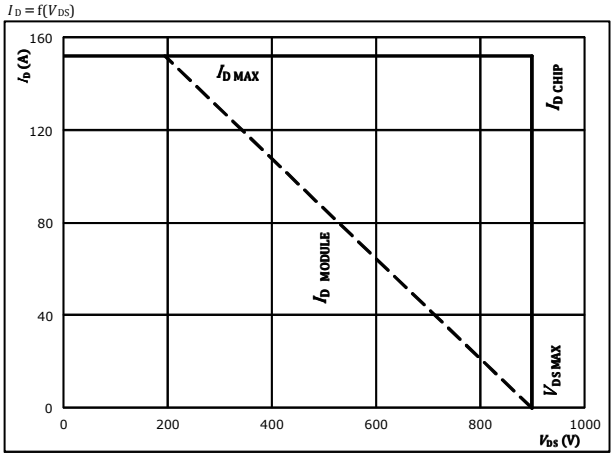
At	V_{DS} =	600	V		
	V_{GS} =	+15/-5	V	T_j:	25 °C
	I_D =	40	A		125 °C
					150 °C

Switching Characteristics

figure 15. **MOSFET**

Reverse bias safe operating area

$I_D = f(V_{DS})$



At

T_j =	175	°C
R_{gon} =	4	Ω
R_{goff} =	4	Ω

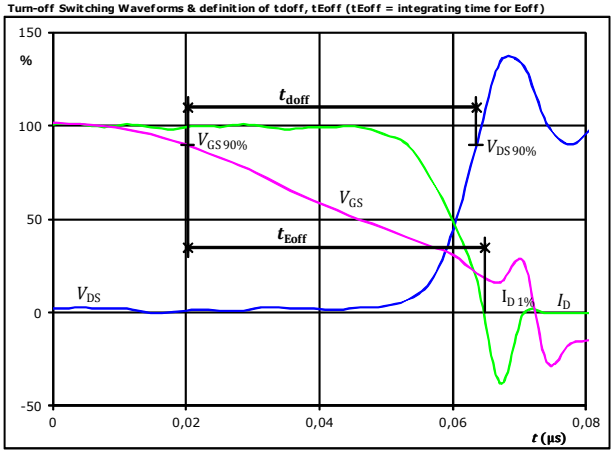
Switching Characteristics

General conditions

T_j	=	**125 °C**
R_{gon}	=	**4 Ω**
R_{goff}	=	**4 Ω**

figure 1. MOSFET

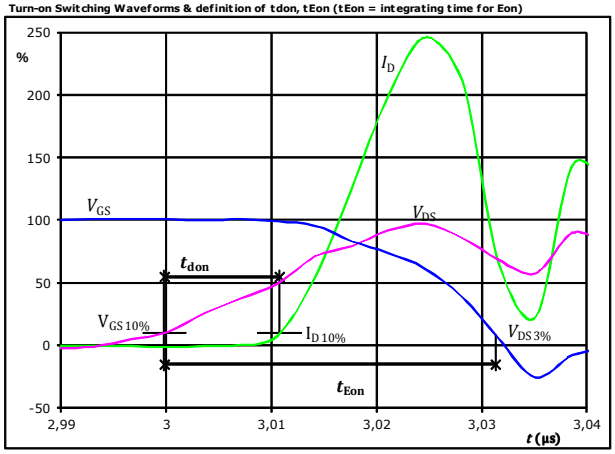
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GS}(0\%)$ =	0	V
$V_{GS}(100\%)$ =	15	V
$V_{DS}(100\%)$ =	600	V
$I_D(100\%)$ =	40	A
t_{doff} =	0,043	µs
t_{Eoff} =	0,045	µs

figure 2. MOSFET

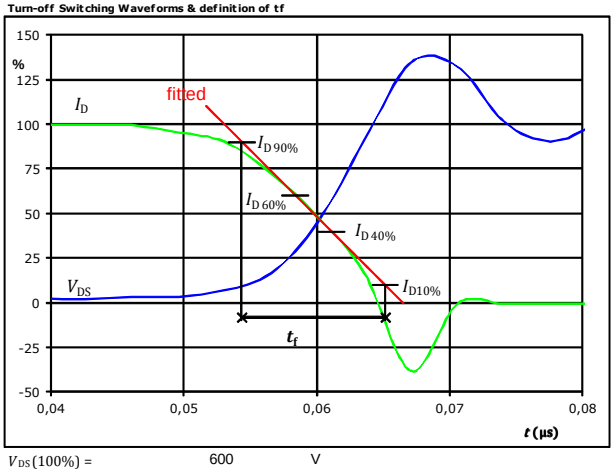
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GS}(0\%)$ =	0	V
$V_{GS}(100\%)$ =	15	V
$V_{DS}(100\%)$ =	600	V
$I_D(100\%)$ =	40	A
t_{don} =	0,013	µs
t_{Eon} =	0,031	µs

figure 3. MOSFET

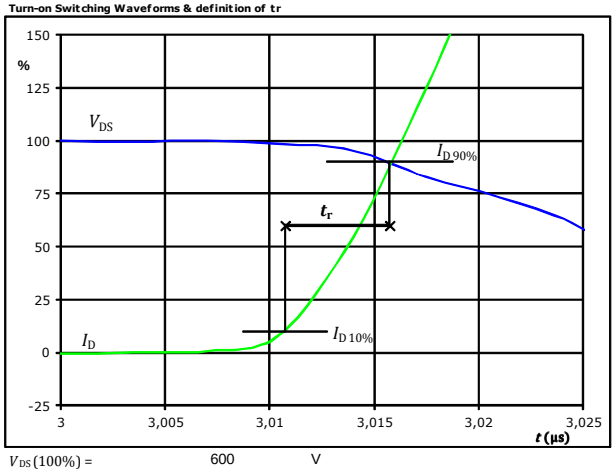
Turn-off Switching Waveforms & definition of tf



$V_{DS}(100\%)$ =	600	V
$I_D(100\%)$ =	40	A
t_f =	0,012	µs

figure 4. MOSFET

Turn-on Switching Waveforms & definition of tr

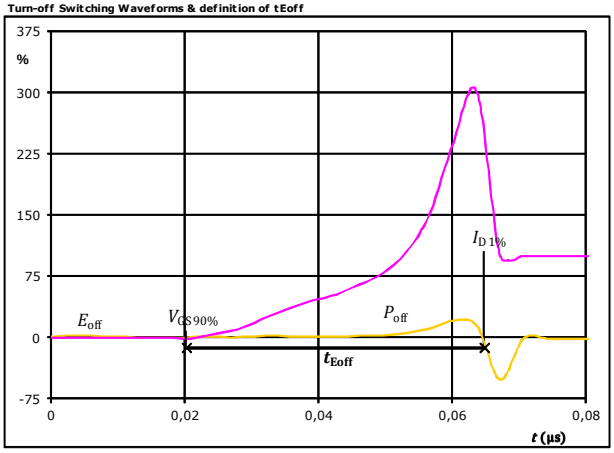


$V_{DS}(100\%)$ =	600	V
$I_D(100\%)$ =	40	A
t_r =	0,005	µs

Switching Characteristics

figure 5. **MOSFET**

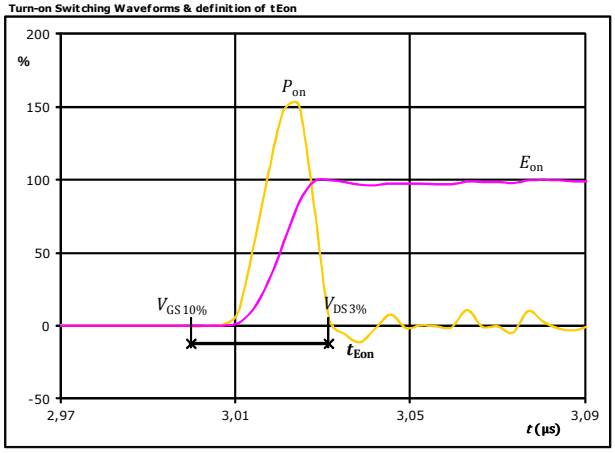
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	23,94	kW
$E_{off}(100\%)$ =	0,06	mJ
t_{Eoff} =	0,04	µs

figure 6. **MOSFET**

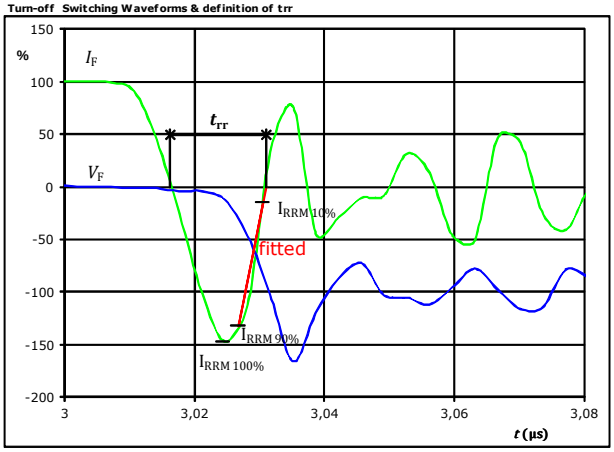
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	23,94	kW
$E_{on}(100\%)$ =	0,45	mJ
t_{Eon} =	0,03	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr



$V_F(100\%)$ =	600	V
$I_F(100\%)$ =	40	A
$I_{RRM}(100\%)$ =	-58	A
t_{rr} =	0,015	µs

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Ordering Code & Marking

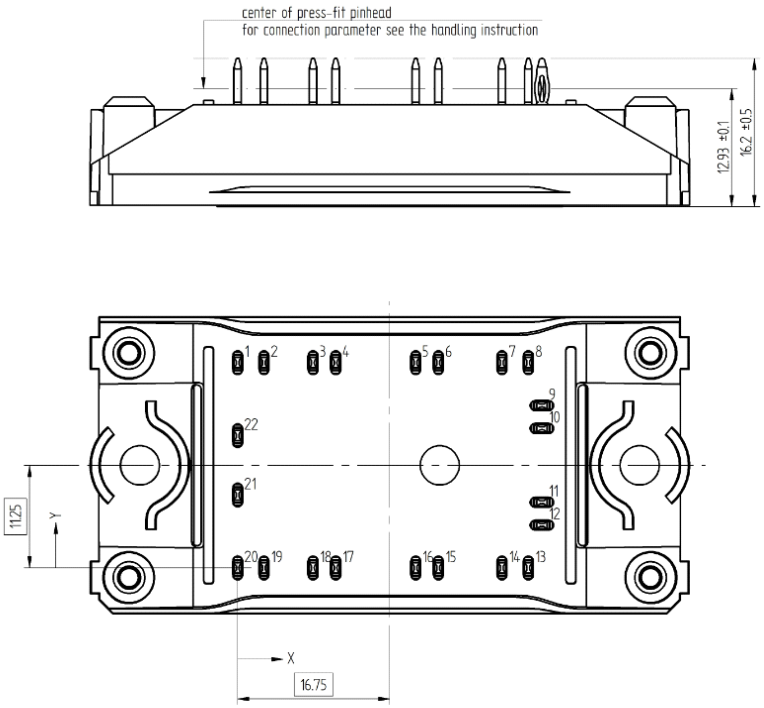
Version	Ordering Code
without thermal paste 12 mm housing with press-fit pins	10-PC094PB035ME02-L629F36Y

NN-NNNNNNNNNNNNN
TTTTTTVV WWYY UL
VIN LLLLL SSSS

		Name		Date code	UL & VIN	Lot	Serial
Text		NN-NNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix		Type&Ver	Lot number	Serial	Date code		
		TTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table			
Pin	X	Y	Function
1	0	22,5	G11
2	2,9	22,5	S11
3	8,3	22,5	DC-1
4	10,8	22,5	DC-1
5	19,6	22,5	DC+
6	22,1	22,5	DC+
7	29,1	22,5	S12
8	32	22,5	G12
9	33,5	17,8	Ph1
10	33,5	15,3	Ph1
11	33,5	7,2	Ph2
12	33,5	4,7	Ph2
13	32	0	G14
14	29,1	0	S14
15	22,1	0	DC+
16	19,6	0	DC+
17	10,8	0	DC-2
18	8,3	0	DC-2
19	2,9	0	S13
20	0	0	G13
21	0	8	Therm1
22	0	14,5	Therm2



Tolerance of pinpositions: ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

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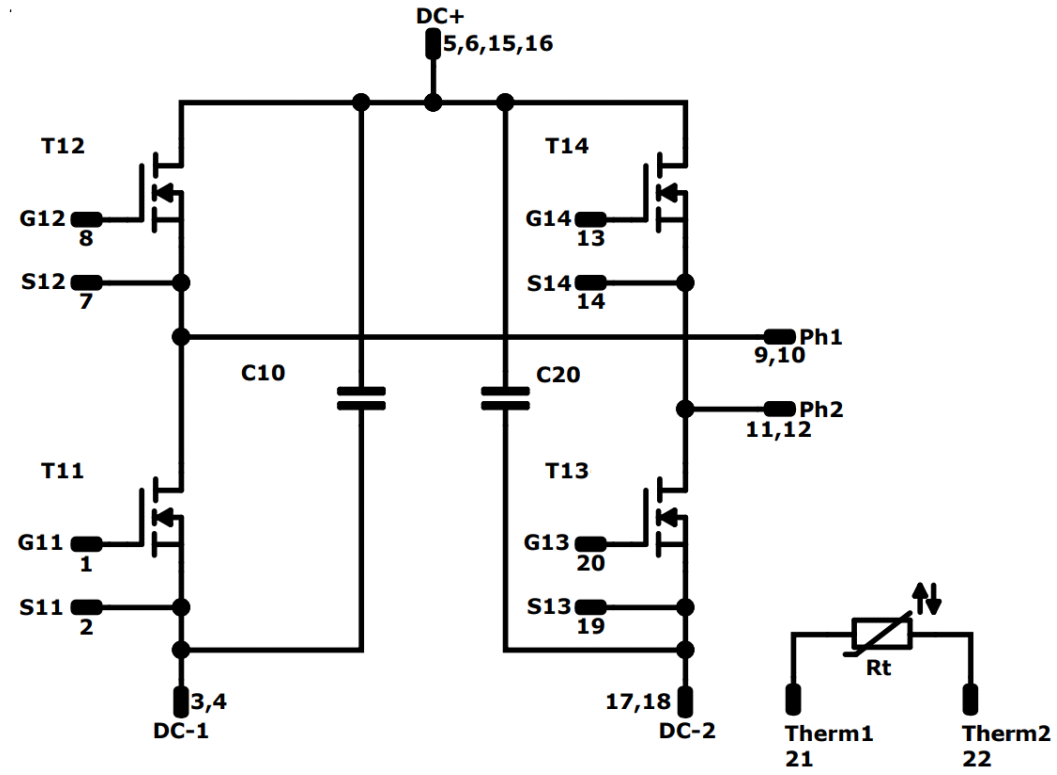
Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14	MOSFET	900 V	35 mΩ	H-Bridge Switch	
C10 , C20	Capacitor	1000 V		Capacitor (DC)	
Rt	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-PC094PB035ME02-L629F36Y-D1-14	14 Jul. 2017		